

Amendment and Response

Applicant: Gerold Gruendler et al.

Serial No.: 10/598,285

Filed: June 21, 2007

Docket No.: I431.174.101/FIN565PCT/US

Title: COOLING SYSTEM FOR DEVICES HAVING POWER SEMICONDUCTORS AND METHOD FOR COOLING THE DEVICE

REMARKS

The following remarks are made in response to the Non-Final Office Action mailed May 19, 2008. Claims 1-9, 12, 13, 20, 21, and 29 have been cancelled without prejudice. Claims 10-29 were rejected. Claims 14, 16, 23, and 24 have been objected to. With this Response, claims 10, 14, 16, 18, 22, and 24-28 have been amended and claims 30-33 have been added. Claims 10, 11, 14-19, 22-28, and 30-33 remain pending in the application and are presented for reconsideration and allowance.

Drawings Objections

With this Response, as illustrated by the Replacement Sheet attached herewith, Figure 1 has been amended to illustrate each of the claimed features as indicated by the Office Action. As such, Applicants respectfully request the objections to the drawings be withdrawn.

Claim Objections

With this Response, claims 14, 16, 23, and 24 have been amended to correct the grammatical informalities indicated by the Office Action. As such, Applicants respectfully request that the objections to claims 14, 16, 23, and 24 be withdrawn.

Claim Rejections under 35 U.S.C. § 103

Claims 10-11, 18-19 and 27-28 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,161,087 to Frankeny et al. (“Frankeny”).

Claims 10-11, 18-19 and 27-28 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,278,610 to Yasufuku et al. (“Yasufuku”).

Claims 12-13, 20-21 and 29 were rejected under 35 U.S.C. 103(a) as being unpatentable over Frankeny in view of U.S. Patent No. 6,424,532 to Kawamura (“Kawamura”).

Claims 14 and 22 were rejected under 35 U.S.C. 103(a) as being unpatentable over Frankeny in view of Kawamura as applied to the above claims, and further in view of U.S. Patent No. 6,775,139 to Hsueh (“Hsueh”).

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Claims 15 and 23 were rejected under 35 U.S.C. 103(a) as being unpatentable over Frankeny in view of U.S. Patent No. 6,130,820 to Konstad et al. (“Konstad”).

Claims 16-17 and 24-25 were rejected under 35 U.S.C. 103(a) as being unpatentable over Frankeny in view of Hsueh.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Frankeny in view of Hsueh and further in view of U.S. Patent No. 5,680,295 to Le et al. (“Le”).

With this Response, claims 12, 13, 20, 21, and 29 have been cancelled without prejudice.

Independent claim 10 has been amended to include the limitations of former dependent claims 12 and 13. Applicants respectfully submit that neither Frankeny nor Kawamura, either alone or in combination, teach or suggest the present invention as defined by amended independent claim 10.

Frankeny describes a single retainer plate 42 having a heat sink 54 which is held in place against all electrical components 24 attached to a substrate 25 (Figures 1-3; Col 1, lines 42-45 and Col. 3, lines 3-12). Frankeny makes no teaching or suggestion that different types of heat sinks should be employed for different types of electrical components 24 of substrate 25. With respect to heat removal, Frankeny simply suggests treating all electrical components 24 identically and employs the single retainer plate 42 and heat sink 54 to cover all electrical components 24 attached to substrate 25. As such, it would not have been obvious in view of Frankeny **to cover only a power semiconductor component on a printed circuit board with a cooling plate and cover remaining non-power semiconductor components arranged on the printed circuit board adjacent to the power semiconductor component with a cooling grid structure**, as defined by amended independent claim 10. Frankeny merely teaches or suggests treating all electrical components identically and covering them with a single heat sink.

Similar to Frankeny, Kawamura describes covering all memory ICs 3 on a printed circuit board 1 of a memory module 10 with a clip-like cover and heat sink 5 having a top plate 5A and side plates 5B and 5C which cover and contact all of the memory ICs 3. Because all of the electrical components of Kawamura are of a single type (i.e. memory ICs 3), Kawamura makes no teaching or suggest that different types of heat sinks should be employed for different types of

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electrical components. With respect to heat removal, Kawamura simply suggests treating all memory ICs 3 identically by covering them with a single cover and heat sink 5. As such, it would not have been obvious in view of Kawamura **to cover only a power semiconductor component on a printed circuit board with a cooling plate and cover remaining non-power semiconductor components arranged on the printed circuit board adjacent to the power semiconductor component with a cooling grid structure**, as defined by amended independent claim 10.

In view of the above, both Frankeney and Kawamura merely teach or suggest applying a single heat sink to cover all electrical components of a printed circuit board. There is no teaching or suggestion to employ different types of heat sinks for different types of electrical components. In fact, Kawamura describes only to a single type of electrical component, that being memory ICs 3, and makes no mention of any other types of components whatsoever. As such, Applicants respectfully submit that the present invention as defined by amended independent claim 10 is not obvious in view of Frankeney or Kawamura, either alone or in combination one another. Accordingly, Applicants respectfully request that the rejection of independent claim 10 under 35 U.S.C. 103 in view of Frankeney, both alone and in further view of Kawamura, be withdrawn.

Furthermore, in a fashion similar to that described above with respect to both Frankeney and Kawamura, Yasufuku describes covering all semiconductor chips 120 mounted on a rectangular board 110 with a single heat sink 230 which rotates into place and contacts semiconductor chips 120 when a metallic cover 220 is rotated to a closed position. As before, Yasufuku makes no teaching or suggestion of employing different types of heat sinks for different types of semiconductor chips 120 on board 110. Yasufuku simply teaches treating all semiconductor chips 120 identically by covering them with a single heat sink 230. As such, it would not have been obvious in view of Yasufuku **to cover only a power semiconductor component on a printed circuit board with a cooling plate and cover remaining non-power semiconductor components arranged on the printed circuit board adjacent to the power semiconductor component with a cooling grid structure**.

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semiconductor component with a cooling grid structure, as defined by amended independent claim 10.

In view of the above, Yasufuku merely teaches or suggests treating all electrical components identically and covering them with a single heat sink. There is no teaching or suggestion to employ different types of heat sinks for different types of electrical components. As such, Applicants respectfully submit that the present invention as defined by amended independent claim 10 is not obvious in view of Yasufuku and respectfully request that the rejection of dependent claim 10 under 35 U.S.C. 103 in view Yasufuku be withdrawn.

Independent claims 18 and 27 have been amended to include limitations similar to those defined by amended independent claim 10. Accordingly, for reasons similar to those described above with respect to independent claim 10, Applicants respectfully request that the rejections of independent claims 18 and 27 under 35 U.S.C. 103 over Frankeny, Kawasura, and Yasufuku, either alone or in combination, be withdrawn as well.

Since dependent claim 11 further defines patentably distinct independent claim 10, dependent claim 19 further defines patentably distinct independent claim 18, and dependent claim 28 further defines patentably distinct independent claim 27, Applicants respectfully request that the rejection of dependent claims 11, 19, and 28 under 35 U.S.C. 103 over both Frankeny and Yasufuku also be withdrawn.

Also, since dependent claim 14 further defines patentably distinct independent claim 10, and dependent claim 22 further defines patentably distinct independent claim 18, Applicants respectfully request that the rejection of dependent claims 14 and 22 under 35 U.S.C. 103 over Frankeny in view of Kawamura and in further view of Hsueh also be withdrawn.

Additionally, since dependent claim 15 further defines patentably distinct independent claim 10, and dependent claim 23 further defines patentably distinct independent claim 18, Applicants respectfully request that the rejection of dependent claims 15 and 23 under 35 U.S.C. 103 over Frankeny in view of Konstad also be withdrawn.

Futhermore, since dependent claims 16 and 17 further defines patentably distinct independent claim 10, and dependent claims 24 and 25 further defines patentably distinct

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independent claim 18, Applicants respectfully request that the rejection of dependent claims 16, 17, 24, and 25 under 35 U.S.C. 103 over Frankeny in view of Hsueh also be withdrawn.

Independent claim 26 has been amended to include limitations similar to those described above with respect to amended independent claim 1. Accordingly, as described above with respect to amended independent claim 10, Applicants submit that Frankeny fails to teach or suggest holding a cooling plate in contact with a corresponding power semiconductor component of a printed circuit board and a covering a plurality of other semiconductor components with a cooling grid structure, as defined by independent claim 9. As such, Applicants respectfully submit that neither Frankeny, Hsueh, nor Le, either alone or in combination with one another, teach or suggest the present invention as defined by independent claim 26. Accordingly, Applicants respectfully request that the rejection of independent claim 26 under 35 U.S.C. 103 over Frankeny in view of Hsueh and Le be withdrawn.

In view of the above, Applicants respectfully request that the rejections of claims 10, 11, 14-19, and 22-28 under 35 U.S.C. 103 be withdrawn and that claims 10, 11, 14-19, and 22-28 be allowed.

Claim Rejections under 35 U.S.C. § 103

With this Response, claims 30-33 have been added. Claim 30 depends from and further defines patentably distinct independent claim 10, claims 31 and 32 depend from and further define patentably distinct independent claim 18, and claim 33 depends from and further defines patentably distinct independent claim 27. Accordingly, Applicants submit that added claims 30-33 are in allowable form over the cited references.

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CONCLUSION

In view of the above, Applicant respectfully submits that pending claims 10, 11, 14-19, 22-28, and 30-33 are in form for allowance and are not taught or suggested by the cited references. Therefore, reconsideration and withdrawal of the rejections and allowance of claims 10, 11, 14-19, 22-28, and 30-33 are respectfully requested.

No fees are required under 37 C.F.R. 1.16(h)(i). However, if such fees are required, the Patent Office is hereby authorized to charge Deposit Account No. 50-0471.

The Examiner is invited to contact the Applicant's representative at the below-listed telephone numbers to facilitate prosecution of this application.

Any inquiry regarding this Amendment and Response should be directed to Steven E. Dicke at Telephone No. (612) 573-2002, Facsimile No. (612) 573-2005. In addition, all correspondence should continue to be directed to the following address:

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Date: October 10, 2008
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Reg. No. 38,431